

Evaluation of Impacts in Groundwater-Surface Water Transition Zones in the Sudbury River, Nyanza Chemical Waste Dump Superfund Site, Ashland, Massachusetts

Cornell J. Rosiu
Region 1 New England
Office of Site Remediation and Restoration
(617) 918-1345
rosiu.cornell@epa.gov

Authors: Cornell J. Rosiu, James F. Coles, and Sharon Hayes

The groundwater-surface water transition zone (TZ) was evaluated at the site in three primary areas of known discharge (Mill Pond, Raceway, and Sudbury River). The objective of the study was to determine in the defined areas whether: 1) groundwater discharge in the TZ or water column immediately above was toxic to aquatic life, 2) whole sediment was itself toxic, or 3) benthic macroinvertebrate communities were impacted relative to reference benthic ecology. Groundwater contamination by volatile organic chemicals and metals was an initial concern because it was toxic to organisms in the laboratory and plume discharges were confirmed through hydrogeological study. A conceptual site model was developed to evaluate *in-situ* toxicity using three species and bioaccumulation in one species, laboratory whole sediment toxicity using two species, and benthic macroinvertebrate community structure using taxonomic identifications. Study results in the Mill Pond and Sudbury River areas indicated groundwater discharge might have caused *in-situ* toxicity in 2 of 4 locations for reasons including whole sediment was not toxic; however, benthic macroinvertebrate community structure was not impacted relative to the reference site. In contrast, results in the Raceway area indicated groundwater discharge might have caused *in-situ* toxicity in 2 of 2 locations and impacted benthic macroinvertebrate community structure, and whole sediment was not toxic. Raceway area results were weighed against the fact that the upper Raceway presented poor habitat for aquatic life as evidenced by large amounts of detritus and organic matter, and shifting dominance of groundwater to stormwater runoff over the course of the field study characterized by rapid changes in turbidity, water temperature, dissolved oxygen, and specific conductance. The poor quality habitat was at least in part attributed to natural conditions or the affects of urbanization. Benthic macroinvertebrate community structure in the Sudbury River area (downstream from the other areas) was impaired, however, at a level to be expected based on non-specific effects of urbanization on stream ecology in New England.